AN ROINN OIDEACHAIS

LEAVING CERTIFICATE EXAMINATION, 1963.

APPLIED MATHEMATICS - PASS.

WEDNESDAY, 19th JUNE—Morning, 10 to 12.30.

Not more than six questions may be answered. All questions are of equal value.
Mathematical Tables may be obtained from the Superintendent.

1. A heavy mass is supported by two strings making an angle of 60° with each other and is in equilibrium. The tensions in the strings are 6 lb. wt. and 9 lb. wt., respectively. Find the weight of the mass correct to one place of decimals.

Find, also, correct to the nearest degree, the angle which the line of action of the weight of the mass makes with the string whose tension is 6 lb. wt.

2. A non-uniform beam AB is 15 inches long and weighs 3 lb. It is smoothly hinged at A and is kept horizontal by means of a vertical light rope attached to it at B. If the tension in the rope is 2 lb. wt., find (i) how far the centre of gravity of the beam is from A, (ii) the reaction of the hinge in magnitude and direction.

If a 1 lb. weight is attached to the beam at its centre, what increase in the tension of the rope will maintain the beam in a horizontal position ?

3. A block is resting on a rough plane which is inclined to the horizontal at an angle of 30°. A force of 10 lb. wt. will just cause the block to move up the plane and a force of 5 lb. wt. will just cause it to move down the plane, the force in each case being along the line of greatest slope. Find the weight of the block and the coefficient of friction.

4. A cyclist starts from rest and after 30 seconds comes to rest again. The following table gives the speed of the cyclist at the corresponding time:

TIME (in seconds)	0	5	10	15	20	25	30
SPEED(in feet per second)	0	8	20	28	20	8	0

Draw a speed-time curve and use it to find, approximately, the distance travelled by the cyclist in the 30 seconds.

5. ABC is a triangular lamina in which AB = AC = 13 cm. and BC = 10 cm. The lamina weighs 6 gm. and weights 10 gm., 1 gm. and 1 gm. are placed at A, B, C, respectively. Find the distance of the centre of gravity of the system from BC.

If the system is suspended at B so that it hangs freely, find the tangent of the angle that AB makes with the vertical.

6. A balloon is ascending vertically at a uniform speed of 48 ft. per sec. and when it reaches a height of 1,120 feet a stone is released. Find (i) the additional height reached by the stone, (ii) the time taken by the stone to reach the ground from the moment of its release.

7. Small raindrops would fall vertically with a constant velocity of 12 ft. per sec. if there were no wind. When a wind blows at 5 ft. per sec. from the west, in what direction and at what speed on a horizontal plane must a man walk in order that the raindrops appear to him to be falling vertically ? If the man were to reverse his direction of walking, without changing his speed, what would be the velocity of the raindrops in magnitude and direction relative to him ? Draw diagrams to illustrate your answers.

8. A car weighing 1 ton accelerates uniformly on a level road in 30 seconds from a speed of 45 m.p.h. to a speed of 60 m.p.h. Calculate the horse-power at which the engine of the car is working. Give your answer correct to two significant figures.

9. State the Principle of Archimedes.

When an object weighing 15 gm. is suspended by a vertical string so that it is totally immersed in a liquid of specific gravity 0·8, the tension in the string is 13 gm. wt. When it is similarly suspended in a second liquid the tension in the string is 13·5 gm. wt. Find the specific gravity of the second liquid.